APPARATUS AND METHOD FOR PROVIDING VISUAL TELECOMMUNICATION TERMINAL STATUS INFORMATION

Cross Reference to Related Applications

This patent application is a Continuation In Part of U.S. Patent Application 10/251,249, filed on 09/20/2002, U.S. Patent Application 10/406,341, filed on 04/03/2003, and both assigned to the same assignee as the present application. U.S. Patent Application 10/251,249 and U.S. Patent Application 10/406,341 are hereby incorporated by reference.

Technical Field

This invention relates to telecommunication switching systems, and in particular, to the provision of visual telecommunication terminal status information.

Background of the Invention

A problem within the art is that people who utilize standard IP telephones or digital telephones, such as an ISDN telephone, and who are hearing impaired can not tell that they have an incoming call unless they are looking at the phone when the call arrives. If the telephone is an analog telephone, there are hardware devices that can be incorporated into the analog tip/ring jacks to allow the detection of a ringing signal and to trigger a visual indicator such as a flashing desktop lamp or strobe light. When used in connection with analog telephones, these devices are bridged onto the same line as

the telephone. In order to provide a similar mechanism for IP telephones or other digital telephones, it is known within the art to associate a separate analog line from the business telecommunication switching system to the hearing impaired user's work area, connect a visual alerting device to that line, and then administer the user's digital or IP telephone line appearance and the separate analog line as bridged line appearances. In this manner, calls to the IP telephone or digital telephone will also trigger a visual alert from the analog device. However, analog lines are expensive to install in many IP and digital telephony environments.

Another problem within the art is that people with poor visual acuity (illustratively, people who may require a magnifying glass in order to read standard-size text) often have trouble reading the display information that is presented visually by these telephones, e.g., the caller ID information. Although caller ID adjuncts with large displays and/or voice-output are well known within the art, these devices require analog connections, and therefore suffer from the same drawbacks that were described in the previous paragraph in reference to visual alerting devices. An alternative mechanism, by which support for blind users of IP and digital telephones may be provided, is described by previous incorporated patent applications; however, because this approach relies on voice output, it may not be the preferred user interface for an individual who still has some residual vision.

Summary of the Invention

The aforementioned problems are solved and a technical advance is achieved in the art by an apparatus and method that uses logical network connections to telephones interconnected by a network to obtain the telecommunication terminal status information and then to convert the telecommunication terminal status information to visual information that is presented to the user.

Brief Description of the Drawing

FIG. 1 illustrates, in block diagram form, an embodiment for implementing the invention;

FIG. 2 illustrates, in block diagram form, an embodiment for implementing the invention;

FIG. 3 illustrates, in pictorial form, an embodiment of an IP telephone set;

FIG. 4 illustrates, in block diagram form, an embodiment of an IP telephone set;

FIG. 5 illustrates, in flow chart form, operations performed by an embodiment of a telecommunication terminal status control routine;

FIG. 6 illustrates, in block diagram form, an embodiment of a monitor computer;

FIGS. 7 and 8 illustrate, in flow chart form, operations performed by an embodiment of a monitor computer;

FIGS. 9 and 10 illustrate, in flow chart form, operations performed by another embodiment of a monitor computer; and

FIG. 11 illustrates, in flow chart form, operations performed by an embodiment of a control computer.

Detailed Description

FIGS. 1 and 2 illustrate embodiments for implementing the invention. In FIG. 1, control computer 101 performs the overall control functions for conventional telephones 107-108 and IP telephone sets 112-113. IP telephone sets 112-113 may be IP telephone set 4624 manufactured by Avaya Inc. or a similar telephone set. Switching network 105 performs the switching of not only audio information but also control information to and from computer 101 to the telephone sets. Computer 101 is interconnected to wide area network (WAN) 111 via network trunk 106. Control computer 101 controls the activity of IP telephone sets 112-113 by the transmission of telecommunication terminal status information and the receipt of telecommunication terminal status information from the IP telephone sets via WAN 111. Control computer 101 controls telephones 107-108 by the transmission of telecommunication terminal status and reception of control information via switching network 105. Control computer 101 comprises processor 121 and memory 122. Processor 121 performs the necessary control functions by executing programs out of

memory 122 as well as storing data in memory 122. Overall control of computer 101 is performed by operating system 123. Control routine 124 performs the overall telecommunication control. Telecommunication terminal status table 126 is a series of telecommunication terminal status tables, one for each telephone, interconnected to telecommunication switching system 101 whether the telephone be a digital, analog, or IP telephone. In an embodiment where a monitor computer directly access telecommunication terminal status table 126, table access routine 127 controls these accesses. Telephone sets 107-108 can be analog telephone sets, ISDN telephone sets, or proprietary digital protocol telephones sets.

Monitor computer 118 is utilized to provide the emphasized visual information representing the telecommunication terminal status signals of one of the IP telephone sets. Monitor computer 118 can be a desktop PC, laptop, a pocket PC, or a hand held unit. In one embodiment of the invention, monitor computer 118 receives the program for implementing the invention via WAN 111 from server 119. Telecommunication switching system 100 is connected to public switching network 116 via CO trunks 109 and trunks 114.

FIG. 2 illustrates another embodiment for implementing the invention. Control computer 202 is controlling the operations of IP telephone sets 207-208 with respect to telecommunication operations by the transmission and reception of control information via WAN 204. Service circuits 206 under the control of control computer 202 provide

tone generation, conferencing, etc. via WAN 204 to IP telephone sets 207-208. For a telecommunication call which is only between two IP telephone sets, the IP telephone sets communicate via WAN 204 for the transmission of audio information. Public switching network 201 is interconnected to WAN 204 via IP trunk 203. Monitor computer 209 and server 219 perform similar functions to those performed by monitor computer 118 and server 119 of FIG. 1.

Consider now an example of how monitor computer 118 would provide emphasized visual telecommunication terminal status information for IP telephone set 112 in one embodiment of the invention. The telecommunication terminal status information that is converted to emphasized visual telecommunication terminal status information could be various alert tones used to inform a user of events taking place with respect to IP telephone set 112 such as, but not limited to, various alerting tones used to indicate incoming calls such as standard ringing for an incoming call or other tones well know to those skilled in the art. In addition, when it is necessary to accommodate the needs of users who have poor visual acuity, the emphasized visual telecommunication terminal status information could be the same information that is presented visually (typically in a smaller, harder-to-read format) by the display 301 of IP telephone 112 as illustrated in FIG. 3. In this embodiment, monitor computer 118 has initially stored in its memory the program and data necessary to provide the emphasized visual

telecommunication terminal status information operations. This is often referred to as monitor computer 118 being a "thick client" by those skilled in the art. To perform its operations, monitor computer 118 needs the IP address for IP telephone set 112. Whereas, it is possible that monitor computer 118 has this information or that it is entered by the user. Another method is for monitor computer 118 to broadcast the telephone number and the password which may be encrypted for IP telephone set 112, along with a request for the corresponding IP address via WAN 111 to all of the IP telephone sets 112-113. IP telephone set 112 is responsive to this request to transmit its IP address to monitor computer 118. In addition, monitor computer 118 could obtain the IP address for IP telephone set 112 by accessing server 119 and obtaining the IP address from server 119 in one embodiment of the invention.

Utilizing the IP address, monitor computer 118 contacts IP telephone set 112 and opens a socket in the TCP/IP control structure of IP telephone set 112 that allows monitor computer 118 to receive the control status information being transmitted from computer 101 via network trunk 106 and WAN 111 to IP telephone set 112. In one embodiment of the invention, monitor computer 118 is responsive to the telecommunication terminal status information being transmitted to IP telephone set 112 to determine if the telecommunication terminal status information is information that should be presented to the user as emphasized visual information. If the status information should be converted to

emphasize visual information, monitor computer 118 determines what display screen should be presented on its monitor for the particular telecommunication terminal status information.

The advantage of the embodiment just described for presenting emphasized visual telecommunication terminal status information is quite clear. First, no connection must be made physically to IP telephone set 112 nor does the program of control computer 101 have to be modified in any manner.

In FIGS. 1 and 2, control computers 101 and 202 maintain telecommunication terminal status tables that define all of the telecommunication terminal status information for all telephones interconnected to the systems including IP, analog and digital telephones. In another embodiment, the monitor computer transmits the telephone number and password for the telephone to be monitored to the control computer of either FIG. 1 or FIG. 2. The control computer verifies that the telephone number and password are correct for that telephone. Once it is established that the information is valid, the control computer establishes a socket with the WAN to allow the monitor computer to gain access to the telecommunication terminal status table associated with the identified telephone. The telephone can be any type of telephone using various transmission protocols such as the IP protocol, proprietary digital protocols, ISDN, analog transmission, etc. Once the socket is established, the monitor computer periodically accesses the telecommunication terminal status table to

determine if there have been any changes in the telecommunication terminal status of the telephone. If the monitor computer determines that a change in the telecommunication terminal status information indicates the necessity of presenting emphasized visual call information to the user of the identified telephone, the monitor computer performs this function.

In the previous examples, the embodiments described utilize a program and data configuration information stored permanently on monitor computer 118. This information had to be pre-stored on monitor computer 118. There are advantages in utilizing such a software structure-namely such a structure is normally more efficient and yields faster performance. However, the previous embodiments do suffer from the disadvantage of having to have the program and data pre-installed on monitor computer 118 before the emphasized visual telecommunication terminal status information operations can be performed. In the embodiments to be described in this section, the only software that must be pre-installed on monitor computer 118 is a web browser. When the user of monitor computer 118 wishes to perform the emphasized visual telecommunication terminal status operations with IP telephone set 112, the user first accesses server 119 utilizing the web browser and obtains from server 119 a JAVA applet or its equivalent Microsoft ActiveX Control entity. The JAVA applet is a JAVA program that will be installed on monitor computer 118 that will perform the operations of establishing the first socket

on IP telephone set 112 in order to obtain the telecommunication terminal status information and, if desired, to establish the second socket that is utilized to present the emphasized visual telecommunication terminal status information to the user. An operation where a computer starts out with only a browser and downloads a JAVA applet to execute certain functions and relies on other programs already installed on monitor computer 118 is commonly referred to as a "thin client" implementation by those skilled in the art. The JAVA applet would utilize the visual reproduction capabilities of software already installed on monitor computer 118 via the browser to present the emphasized visual telecommunication terminal status information to the user. The visual files that would be utilized for the emphasized visual telecommunication terminal status information would be, however, downloaded from server 119 in the JAVA applet. In addition, the visual interface utilized by the user of monitor computer 118 would be downloaded as a web page to monitor computer 118 and operate under control of the browser. As different commands were indicated on the visual interface web page, the browser would respond by calling the appropriate JAVA code that was part of the JAVA applet.

One advantage of the "thin client" embodiments is that the user interface is nothing more than a web page design that is done at a high level. In addition, server 119 is a central place where necessary and desired changes in the JAVA code can be made without directly interacting with monitor computer 118

in order to pre-install software. In addition, the customization of the visual interface web page utilized by the user of a computer such as monitor computer 118 is greatly enhanced by the user being able to interact with server 119 via the browser of monitor computer 118. Not only are users used to utilizing browsers, but the development of the necessary program is made a great deal easier because of this type of interface. Also, if the owner of the systems illustrated in FIG. 1 or 2 wishes, they can easily place predefined user interfaces on server 119. In addition, it is easy to utilize different display screens for different types of emphasized visual telecommunication terminal status information with respect to a country. A new display screen can be added simply by putting the necessary screen information onto server 119 where the display screens can be selected by the users or by user profiles created by the owner of the system.

The previous embodiments described for FIG. 1 can be implemented on the system illustrated in FIG. 2.

In the previous sections, it was described how emphasized visual telecommunication terminal status information could be provided to a user of an IP telephone set such as IP telephone sets 112 –113. It is also highly desirable to provide emphasized visual telecommunication terminal status information for the users of more conventional telephones such as telephone sets 107-108. These telephone sets may be analog, ISDN, or proprietary protocol type telephone sets.

To understand how emphasized visual telecommunication terminal status information could be provided for a user of telephone set 108, consider the following example. To set up the operations of providing the emphasized visual telecommunication terminal status information, the user of telephone set 108 utilizes monitor computer 118 to establish a logical connection with the control computer 101 via WAN 111 and network trunk 106. In one embodiment, monitor computer 118 establishes this logical connection to computer 101 by opening a socket on computer 101 to a telecommunication terminal status control routine. The user of monitor computer 118 then identifies telephone set 108 by telephone number and supplies an optional password to control computer 101. Control computer 101 is responsive to monitor computer 118 to transmit all control status information not only to telephone set 108 but also to monitor computer 118 via WAN 111. In addition, control computer 101 may optionally transmit to monitor computer 118 control information received from telephone set 108.

Monitor computer 118 is responsive to the telecommunication terminal status information and control information received from computer 101 via WAN 111 to perform the previously described operations of providing emphasized visual telecommunication terminal status information.

The program utilized by monitor computer 118 to provide the emphasized visual telecommunication terminal

status information may be performed in either a thick client form or a thin client form. The thin client form has the advantage of being easier to modify by the owner of the system illustrated in FIG. 1 or the manufacturer as changes are made in the software being executed by control computer 101. In addition, the visual interface in the thin client implementation is a web page and can be more readily modified than the visual interface of the thick client implementation.

FIG. 3 illustrates an embodiment of IP telephone set 112. The user of IP telephone set 112 speaks and listens through handset 302. Although not illustrated in FIG. 3, IP telephone set 112 also has a speaker and microphone for conference calls. Display 301 is utilized to display the telephone number being dialed by keypad 309 during the placement of an outgoing call and displays the name and telephone number of the calling party for an incoming call. IP telephone set 112 has a number of telephone lines that could be selected with each line being denoted by a pair of indicators and a button. For example, indicators 303 and 304 and button 307 indicate line 1. Indicators 305 and 306 and button 308 indicate line 2. If the user is active on line 1, indicator 304 will be on as well as indicator 303. If the user has a caller on hold on line 2, indicator 305 will flash. The user of IP telephone set 112 selects line 1 by activating button 307. Similarly, the user activates line 2 by activating button 308.

Pairs of indicators and buttons, such as indicator 309 and button 311, may be used for activating a variety of

operations. One is to automatically dial a party that had been preprogrammed by the user or to activate a feature such as using the conference facilities of IP telephone set 112. If button 311 is activated, indicator 309 will turn on. Indicator 312 and button 314 have similar functions. In general, there would be a number of such combinations of indicators and buttons as illustrated by 309, 311, 312, and 314. All button activation information is transmitted to control computer 101, and control computer 101 controls the state of the indicators.

FIG. 4 illustrates, in block diagram form, one embodiment of IP telephone set 112. Processor 402 provides the overall control for the functions of IP telephone set 112 by executing programs and storing and retrieving data from memory 401. Processor 402 connects to WAN 111 or 204 via interface 403. Processor 402 interfaces to handset 302 via interface 407 and connects to visual display and buttons 419 via interface 409. Visual display and buttons 419 is all of the indicators, buttons keypad, and display illustrated in FIG. 3. Processor 402 performs the operations of IP telephone set 112 by executing the routines illustrated in memory 401.

Operating system 412 provides the overall control and the necessary protocol operations. Operating system routine 412 provides all control functions required to implement the TCP/IP protocol as is well known to those skilled in the art. Data is stored in data block 413. CODEC 414 encodes and decodes the audio information for communication with handset 302 or conference speaker and microphone 406 for

communication with WAN 111 or 204. Overall control of the call processing is performed by the IP telephone set 112 under the control of call processing routine 416. The communication and control of the various interfaces illustrated in FIG. 4 is provided by interfaces routine 417. Ring generator 418 controls transducer 411 to provide alerting for incoming calls.

Telecommunication terminal status control routine 408 terminates the socket that is established by monitor computer 118 to receive the telecommunication terminal status information from IP telephone set 112 as described in the previous examples. Operating system 412 is responsive to messages from monitor computer 118 to establish the socket that allows monitor computer 118 to communicate with telecommunication terminal status control routine 408. When monitor computer 118 opens a socket on IP telephone set 112, it uses the IP address of IP telephone set 112 to transmit a message to a TCP/IP port on IP telephone set 112 that is associated with telecommunication terminal status control routine 408. Operating system 412 is response to this message to establish a socket for monitor computer 118 to receive telecommunication terminal status information from IP telephone set 112. This socket interconnects monitor computer 118 and telecommunication terminal status control routine 408. The operating system of the IP telephone set 112 then directs future messages for the port from monitor computer 118 to this socket from which the messages are transferred to telecommunication terminal status control

routine 408. Similarly, messages from telecommunication terminal status control routine 408 to the socket are transmitted to monitor computer 118. Telecommunication terminal status control routine 408 receives information from call processing routine 416 concerning control information received via WAN 111 to update indicators or display 301 of visual display and buttons 419. Similarly, telecommunication terminal status control 408 receives actuation information for transducer 411. Telecommunication terminal status control 418 transmits this telecommunication terminal status information to monitor computer 118.

FIG. 5 illustrates, in flowchart form, operations performed by an embodiment of a telecommunication terminal status control routine such as telecommunication terminal status control routine 408 of FIG. 4. After being started in block 500, decision block 501 determines if the routine is active with respect to receiving telecommunication terminal status information from an IP telephone set. Active in this case means that there is a socket set up to an IP telephone set by the operating system. If the answer is no, decision block 502 determines if there is a message containing a telephone number and password of an IP telephone set. This indicates that a monitor computer is attempting to establish communication with a telecommunication terminal status control routine. If the answer is yes, decision block 503 determines if the telephone number and password for this particular IP telephone set has been received. If the answer is

no, control is transferred back to decision block 501. If the answer is yes, block 504 makes the state active and sends a message to the operating system to establish the socket with the IP telephone set. Note, that one skilled in the art could readily envision that blocks 501-504 could be performed within the operating system or some other routine.

If the answer is yes in decision block 501 or no in decision block 502, control is transferred to decision block 506. Decision block 506 determines if there is a telecommunication terminal status message from the call processing routine. If the answer is no, control is transferred to decision block 507 which determines if communication has been lost with the monitor computer. The operating system would normally detect this loss of communication and inform the telecommunication terminal status control routine in a manner well known to those skilled in the art. If the answer is no in decision block 507, control is transferred to block 509 which performs normal processing before returning control back to decision block 501. If the answer in decision block 507 is yes, control is transferred to block 508 which sets the state to non-active before returning control back to decision block 501.

Returning to decision block 506. If a telecommunication terminal status message has been received from the call processing routine, block 511 transmits this message to the monitor computer before transferring control back to decision block 501.

FIG. 6 illustrates, in block diagram form, one embodiment of a monitor computer. Processor 602 provides the overall control for the functions of a monitor computer by executing programs and storing and retrieving data from memory 601. Processor 602 connects to WAN 111 or 204 via interface 603. Processor 602 interfaces to user input device 611 via interface 607 and connects to display 619 via interface 609. Processor 602 performs the operations of a monitor computer by executing the routines illustrated in memory 601.

Operating system 612 provides the overall control and the necessary protocol operations. Operating system routine 612 provides all control functions required to implement the TCP/IP protocol as is well known to those skilled in the art. Data is stored in data block 613. Interface database 616 stores preferences and options that define the user interface. Overall control is performed by control routine 616. The communication and control of the various interfaces illustrated in FIG. 6 is provided by interfaces routine 617. Display driver 618 controls the displaying of information on display 619.

FIGS. 7 and 8 illustrate, in flowchart form, operations performed by one embodiment of a monitor computer such as monitor computer 118 of FIG. 1 where the monitor computer is receiving the telecommunication terminal status information from an IP telephone set. After being started, in block 700, block 701 obtains the control routine whose operations are illustrated in FIGS. 7 and 8. The control routine will be obtained

from internal memory if the embodiment is implementing a thick client implementation; and the control routine will be obtained from a server, such as server 119, if the embodiment is implementing a thin client implementation. After the control routine is obtained and executed, block 703 obtains the telephone number and password for the IP telephone set that is to be monitored. Block 703 may perform this operation by obtaining it from a server such as server 119. In addition, the user may know the telephone number and the password and enter it manually. After execution of block 703, block 704 broadcasts the telephone number and password to all of the IP telephone sets.

After execution of block 704, control is transferred to decision block 706 which determines if an IP telephone set responded to the broadcasting of the telephone number and the password. One skilled in the art would readily realize that the telephone number and password could be encrypted so that it was not possible for a computer to fraudulently gain access to the control status information of an IP telephone set. If the answer in decision block 706 is no, control is transferred to block 707 which performs error recovery before transferring control back to block 703. If the answer is decision block 706 is yes, block 708 establishes a socket with the operating system of the IP telephone set that responded. The socket establishes communication to the telecommunication terminal status control routine of that IP telephone set before transferring control to decision block 801 of FIG. 8.

Decision block 801 determines if telecommunication terminal status information has been received as a message from the IP telephone set. If the answer is no, decision block 802 determines if communication has been lost between the monitor computer and the IP telephone set. If the answer is yes, operations are terminated in block 809. In addition to transferring control to block 809 upon communication being terminated between the monitored computer and the IP telephone set, decision block 802 also is responsive to user input to terminate operations. If the answer is no in decision block 802, control is transferred back to decision block 801.

Returning to decision block 801, if the answer is yes, control is transferred to block 803 which accesses the interface database to determine if the particular telecommunication terminal status information should be presented to the user. If the answer is no in decision block 803, control is transferred back to decision block 801. If the answer is yes in decision block 803, control is transferred to decision block 804 which determines from the interface database if the telecommunication terminal status information is to be displayed as emphasized visual information. An alerting message may be such telecommunication terminal status information for which the monitor computer will indicate the alerting message as a visual ringing screen to the user. If the answer in decision block 804 is that the monitor computer should present the information, block 805 accesses the emphasized visual screen from the interface database, and

block 806 displays the emphasized visual screen. If the decision in decision block 804 is no, control is returned to decision block 801.

FIGS. 9 and 10 illustrate, in flowchart form, operations performed by one embodiment of a monitor computer such as monitor computer 118 of FIG. 1 where the monitor computer is receiving the telecommunication terminal status information from a control computer that is controlling a switching system, such as telecommunication switching system 100. After being started, in block 900, block 901 obtains the control routine whose operations are illustrated in FIGS. 9-10. The control routine will be obtained from internal memory if the embodiment is implementing a thick client implementation; and the control routine will be obtained from a server, such as server 119 if the embodiment is implementing a thin client implementation. After the control routine is obtained and executed, block 903 obtains the telephone number and password for the telephone set that is to be monitored. Block 903 may perform this operation by obtaining it from a server such as server 119. In addition, the user may know the telephone number and the password and enter it manually. After execution of block 903, block 904 transmits the telephone number and password to the control computer.

After execution of block 904, control is transferred to decision block 906 which determines if the control computer responded and accepted the telephone number and the password as valid. One skilled in the art would readily realize

that the telephone number and password could be encrypted so that it was not possible for a computer to fraudulently gain access to the control status information of a telephone set. If the answer in decision block 906 is no, control is transferred to block 907 which performs error recovery before transferring control back to block 903. If the answer is decision block 906 is yes, block 908 establishes a socket with the operating system of the control computer to obtain access to a telecommunication terminal status table that the control computer maintains for the telephone. The socket establishes communication to the telecommunication terminal status control routine of the control computer before transferring control to decision block 1000 of FIG. 10.

Decision block 1000 determines if it is time to check the telecommunication terminal status information for a telephone by accessing the telecommunication terminal status table on the control computer. If the answer is no in decision block 1000, control is transferred to decision block 1002. If the answer is yes in decision block 1000, control is transferred to decision block 1001. Decision block 1001 determines if telecommunication terminal status information has been received as a message for the telephone set. If the answer is no, decision block 1002 determines if communication has been lost between the monitor computer and the control computer. If the answer is yes, operations are terminated in block 1009. In addition to transferring control to block 1009 upon communication being terminated between the monitored

computer and the control computer, decision block 1002 also is responsive to user input to terminate operations. If the answer is no in decision block 1002, control is transferred back to decision block 1001.

Returning to decision block 1001, if the answer is yes, control is transferred to block 1003 which accesses the interface database to determine if the particular telecommunication terminal status information should be presented to the user. If the answer is no in decision block 1003, control is transferred back to decision block 1001. If the answer is yes in decision block 1003, control is transferred to block 1004. Block 1004 accesses the appropriate visual ringing screen from the interface database, and block 1006 transmits the appropriate visual screen to the display of the monitor computer before transferring control back to decision block 1001.

FIG. 11 illustrates an embodiment of the operations performed by a control computer when a monitor computer is access a telecommunication terminal status table stored in the control computer. As is well known by those skilled in the art, a control computer controlling the operations of a telecommunication system maintains a telecommunication terminal status table for each telephone connected to the telecommunication system regardless of whether this telephone is an IP , analog , proprietary digital protocol telephone, or ISDN telephone. Once started in block 1101, the control computer determines if there is a request from a monitor

computer to open a socket to gain access to a telecommunication terminal status table for a telephone. If the answer is no, control is transferred to decision block 1107. If the answer is yes in decision block 1102, control is transferred to decision block 1103. The latter decision block determines if the request from the monitor computer contains a valid telephone number and password. If the answer is no, control is transferred to error recovery block 1104 which performs error recovery before transferring control back to decision block 1102. If the answer in decision block 1103 is yes, block 1106 transmits an acknowledgement to the monitor computer and sets up the necessary socket and software so that the monitor computer can obtain the requested telecommunication terminal status table. Then block 1106 transfers control to decision block 1107.

Decision block 1107 determines if there is a request from a monitor computer to access a telecommunication terminal status table for a particular telephone. The monitor computer has to establish a socket via the operations of block 1106 to perform a request for a particular telephone. If the answer is no in decision block 1107, control is transferred to block 1109 which performs normal processing before transferring control back to decision block 1102. If the answer in decision block 1107 is yes, block 1108 transmits the telecommunication terminal status table for the particular telephone to the monitor computer before transferring control back to decision block 1102.

When the operations of an IP telephone set, control computer or monitor computer are implemented in software, it should be noted that the software can be stored on any computer-readable medium for use by or in connection with any computer related system or method. In the context of this document, a computer-readable medium is an electronic, magnetic, optical, or other physical device or means that can contain or store a computer program for use by or in connection with a computer related system or method. The IP telephone set, control computer or monitor computer can be embodied in any computer-readable medium for use by or in connection with an instruction execution system, apparatus, or device such as a computer-based system, processor-containing system, or other system that can fetch the instructions from the instruction execution system, apparatus, or device and execute the instructions. In the context of this document, a "computer-readable medium" can be any means that can store, communicate, propagate, or transport the program for use by or in connection with the instruction execution system, apparatus, or device. For example, the computer-readable medium can be, but is not limited to, an electronic, magnetic, optical, electromagnetic, infrared, or semiconductor system, apparatus, device, or propagation medium. More specific examples (a non-exhaustive list) of the computer-readable medium would include the following: an electrical connection (electronic) having one or more wires, a portable computer diskette (magnetic), a random access memory (RAM) (electronic), a

read-only memory (ROM) (electronic), an erasable programmable read-only memory (EPROM, EEPROM, or Flash memory) (electronic), an optical fiber (optical), and a portable compact disc read-only memory (CDROM) (optical). Note that the computer-readable medium could even be paper or another suitable medium upon which the program is printed, as the program can be electronically captured, for instance, via optical scanning of the paper or other medium, then compiled, interpreted or otherwise processed in a suitable manner if necessary, and then stored in a computer memory.

In an alternative embodiment, where IP telephone set, control computer or monitor computer is implemented in hardware, IP telephone set, control computer or monitor computer can be implemented with any or a combination of the following technologies, which are each well known in the art: a discrete logic circuit(s) having logic gates for implementing logic functions upon data signals, an application specific integrated circuit (ASIC) having appropriate combinational logic gates, a programmable gate array(s) (PGA), a field programmable gate array (FPGA), etc.

Of course, various changes and modifications to the illustrated embodiments described above will be apparent to those skilled in the art. These changes and modifications can be made without departing from the spirit and scope of the invention and without diminishing its intending advantages. It is therefore intended that such changes and modifications be

covered by the following claims except insofar as limited by the prior art.